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ABSTRACT

A method of fabricating a semiconductor device, having a nitride/high-k material/nitride gate dielectric stack with good thermal stability which does not diffuse into a silicon substrate, a polysilicon gate, or a polysilicon-germanium gate when experiencing subsequent high temperature processes, involving: (a) providing a substrate; (b) initiating formation of the nitride/high-k material/nitride gate dielectric stack by depositing a first ultra-thin nitride film on the substrate; (c) depositing a high-k material, such as a thin metal film, on the first ultra-thin nitride film; (d) depositing a second ultra-thin nitride film on the high-k material, thereby forming a sandwich structure; (e) completing formation of the nitride/high-k material/nitride gate dielectric stack from the sandwich structure; and (f) completing fabrication of the semiconductor device, and a device thereby formed.